REMARKS

This Amendment, submitted in response to the non-final Office Action dated June 17, 2004, is believed to be fully responsive to the points of rejection raised therein. Accordingly, favorable reconsideration on the merits is respectfully requested.

Claims 1-24, 27-30 and 32 are pending. Claims 25, 26 and 31 have been cancelled. Claims 6, 15, 24, 28 and 32 have been amended. No new matter has been added by the amendments.

Claims 1-4, 6, 7 and 11 have been rejected under 35 USC 102(b) over US Patent No. 5,491,409 (Flora). Claims 12-14, 20, 21, 24, 25, 27-29, 31 and 32 have been rejected under 35 USC 103(a) over Flora. Claims 5, 8-10, 22, 23, 26 and 30 have been rejected under 35 USC 103(a) over Flora, in view of US Patent No. 6,150,809 (Tiernan). The Examiner indicated that Claims 15-19 would be allowable if rewritten in independent form. Applicants respectfully submit the following remarks in support of the patentability of the claims.

1. Claims 1-4, 6, 7 and 11:

a. Claims 1-4 and 11:

Claim 1 is directed to a pulsed eddy current (PEC) sensor probe that includes a sensor array board. A number of sensors are arranged on the sensor array board and are operable to sense and generate output signals from the transient electromagnetic flux in a part being inspected. Each of the sensors has a differential output comprising a positive and a negative output. At least one drive coil is disposed adjacent to the sensors and is operable to transmit transient electromagnetic flux into the part being inspected. The PEC sensor probe further includes a first multiplexer arranged on the sensor array board and operable to switch between the sensors and a second multiplexer arranged on the sensor array board and operable to switch between the sensors. The first multiplexer is connected to the positive outputs of the sensors, and the second multiplexer is connected to the negative outputs of the sensors.

Claim 1 is directed to a PEC sensor probe. Flora is directed to a multiple yoke eddy current technique for detection of surface defects on metal components covered with marine growth. Based on a review of the reference, it appears that Flora is not directed to

pulsed eddy current inspection but rather uses sinusoidal excitation signals. (See, for example, Col. 5, line 51 - Col. 6, line 15.) More particularly, Flora is directed to a low frequency eddy current (LOFEC) method and device, not to pulsed eddy current inspection. (Col. 3, lines 1-5)

The PEC sensor probe of Claim 1 includes a sensor array board. A number of sensors are arranged on the sensor array board and are operable to sense and generate output signals from the transient electromagnetic flux in a part being inspected. Based on a review of the reference, Flora does not appear to disclose a sensor array board. In particular, the portion of Flora cited in the Office action states:

> FIGS. 18 and 19 show yet another embodiment similar to FIGS. 16 and 17, but there is a fixed array of sensors 30 that are multiplexed to scan the component. The fixed array of sensors provides the advantages of reduced size, weight and the elimination of moving parts. Inspection of a relatively large area can be accomplished by simply holding the magnetizing yoke 10 against the component and performing the automatic multiplexing and signal response sampling of the sensor array. Advantages of the embodiments shown in FIGS. 16-19 include the following.

(Col. 5, lines 18-27) FIG. 19 is a bottom view of the embodiment shown in FIG. 18. Applicants respectfully submit that neither FIG. 19 nor the cited portion of Flora expressly disclose a sensor array board.

The PEC sensor probe of Claim 1 further includes a first multiplexer arranged on the sensor array board and operable to switch between the sensors and a second multiplexer arranged on the sensor array board and operable to switch between the sensors. Flora does not disclose a multiplexer arranged on a sensor array board as recited by Claim 1. In particular, the portions of Flora cited in the Office action state:

> Stationary magnetic flux sensors in arrays extending from one leg of the magnetizing yoke to the other can be sampled in sequence by using multiplexers to detect the changes in magnetic flux caused by defects in the component, thereby eliminating the requirement for moving parts to inspect the component.

(Col. 5, lines 35-40) and

> This probe design containing a fixed array of magnetic flux sensors allows a means for sensors, associated electrical cables and on-probe electronics to be sealed for use under water.

(Col. 5, lines 47-50). Similarly, the figures of Flora do not disclose on-board multiplexing.

For at least these reasons, Applicants respectfully submit that Claim 1 is not anticipated by Flora. As Claims 2-4 and 11 depend from Claim 1, these claims are also patentably distinguishable over Flora for at least the reasons cited above with respect to Claim 1.

In addition, Claim 11 depends from Claim 1 and further recites that the sensor array board comprises a printed circuit board. This recitation does not appear to have been addressed in the Office Action and Applicants found no teaching of a printed circuit board in Flora. For this additional reason as well, Applicants respectfully submit that Claim 11 is not anticipated by Flora and respectfully request that the rejection of Claim 11 be withdrawn.

b. Claims 6 and 7:

Claim 6 has been rewritten in independent form. Claim 6 recites a pulsed eddy current (PEC) sensor probe that includes a sensor array board. A number of sensors are arranged on the sensor array board and are operable to sense and generate output signals from the transient electromagnetic flux in a part being inspected. Each of sensors has a differential output comprising a positive and a negative output. The sensors are positioned at an edge of the sensor array board, and each of sensors has an axis of sensitivity that is oriented substantially normal to the edge. At least one drive coil is disposed adjacent to the sensors and is operable to transmit transient electromagnetic flux into the part being inspected. The PEC sensor probe further includes a first multiplexer arranged on the sensor array board and operable to switch between the sensors and a second multiplexer arranged on the sensor array board and operable to switch between the sensors. The first multiplexer is connected to the positive outputs of the sensors, and the second multiplexer is connected to the negative outputs of the sensors.

All of the remarks presented above with respect to Claim 1 apply with equal force to Claim 6. In addition, Claim 6 further recites that the sensors are positioned at an edge of the sensor array board, and each of sensors has an axis of sensitivity that is oriented substantially normal to the edge. As explained in paragraph 29 (bottom of page 7), Figures 1 and 2 illustrate this embodiment.

Applicants respectfully submit that Flora doesn't teach or suggest these additional recitations of Claim 6. In particular, the portion of Flora cited by the Examiner states:

> FIGS. 13 and 14 show that the magnetic flux sensors 30 in linear arrays are oriented in different directions, either parallel or perpendicular to the excitation coil 20.

As noted above, Flora does not appear to disclose a sensor array board. Nor does Flora discuss the arrangement of the magnetic flux sensors on an array board. Flora does not teach or suggest that the sensors are positioned at an edge of the sensor array board, and that each of sensors has an axis of sensitivity that is oriented substantially normal to the edge, as recited in Claim 6 and as shown, for example in FIG. 1.

For at least these reasons, Applicants respectfully submit that Claim 6 is not anticipated by Flora. Further, as Claim 7 depends from Claim 6, Claim 7 is not anticipated by Flora for at least the reasons discussed above with respect to Claim 6. Accordingly, Applicants respectfully request that the rejections of Claims 6 and 7 be withdrawn.

2. Claims 12-14, 20, 21, 24, 27-29 and 32:

a. Claims 12-14, 20 and 21:

Claim 12 is directed to a pulsed eddy current (PEC) sensor probe that includes a number of sensor array boards that are arranged to form a two-dimensional sensor array.

Applicants respectfully submit that, although Flora discloses aligning two or more probes side-by side (Col. 5, lines 40-45), Claim 12 is patentably distinguishable over Flora for at least the reasons presented above with respect to Claim 1. Further as Claims 13, 14, 20 and 21 depend from Claim 12, these claims are also patentably distinguishable over Flora for at least these reasons. Accordingly, Applicants respectfully request that the rejections of Claims 12-14, 20 and 21 be withdrawn.

b. Claims 24 and 27:

Claim 24 has been amended to include the additional recitations of original Claims 25 and 26. Amended Claim 24 is directed to a method of inspecting a part that includes positioning a linear array of sensors adjacent to a surface of the part, where each of the sensors has an axis of sensitivity aligned substantially normal to the surface of the part, and generating a magnetic flux that is oriented in a direction

substantially along the axis of sensitivity of the sensors to transmit transient electromagnetic flux into the part; and sensing the transient electromagnetic flux in the part being inspected. The method further includes generating a differential output signal using one of the sensors, where generation of the magnetic field and sensing and generating the differential output signal using one of the sensors are repeated for at least a subset of the sensors in the linear array to acquire a number of the differential output signals. Each of the differential output signals comprises a positive and a negative output. The method further includes indexing and storing the differential output signals to indicate the respective sensors used to generate the differential output signals, generating a calibration curve for each of the sensors, calculating a number of informative parameter values for the differential output signals, each of the informative parameter values being associated with a respective one of the sensors. The method further includes comparing the informative parameter values with the respective calibration curves.

The Examiner cites Tiernan to supply the step of generating a calibration curve for each of the sensors. Briefly, Tiernan is directed to giant magnetoresistive (GMR) sensors and sensor arrays for detection and imaging of anomalies in conductive materials. Tiernan teaches an image-forming technique (Col. 17, lines 4-10) involving scanning a sensor over a test part, taking data at preset (here 500mm) increments and plotting the GMR signal sensor amplitude for each point on a 2D grid, to form the images shown in Figures 23.

Applicants respectfully submit that neither the primary (Flora) nor the secondary reference (Tiernan) disclose calculating a number of informative parameter values for the differential output signals, each of the informative parameter values being associated with a respective one of the sensors, as recited by Claim 24. For at least these reasons, Applicants submit that Claim 24 is patentably distinguishable over the cited art, either alone or in combination. Further, as Claim 27 depends from Claim 24, it is patentably distinguishable over the cited art, for at least the reasons discussed above with respect to Claim 24. Accordingly, Applicants respectfully request that the rejections of Claims 24 and 27 be withdrawn.

c. Claims 28, 29 and 32:

Claim 28 has been amended to include the additional recitations of original Claim 31. Claim 32 has been amended to depend from Claim 28. Amended Claim 28 is directed to a method of inspecting a part that includes positioning a two dimensional sensor array adjacent to a surface of the part. The two dimensional sensor array includes

a number of linear arrays of sensors, each of the linear arrays being disposed on a respective one of a number of sensor array boards. Each of the sensors has an axis of sensitivity aligned substantially normal to the surface of the part. The method further includes generating a magnetic flux that is oriented in a direction substantially along the axis of sensitivity of the sensors to transmit transient electromagnetic flux into the part, sensing the transient electromagnetic flux in the part being inspected, and generating a differential output signal using one of the sensors. The steps of generating the magnetic field and sensing and generating the differential output signal using one of the sensors are repeated for at least a subset of the sensors in respective ones of at least a subset of the linear arrays to acquire a number of the differential output signals. Each of the differential output signals comprises a positive and a negative output. The method further includes performing on-board multiplexing to switch between the sensors within a respective one of the linear arrays.

The Examiner cites Col. 5, lines 47-50 to supply the on-board multiplexing recitation of Claim 28. However, for the reasons presented above with respect to Claim 1, Applicants respectfully submit that Flora does not disclose this recitation of Claim 28. Accordingly, Applicants respectfully submit that Claim 28 is patentably distinguishable over Flora. Further as Claims 29 and 32 depend from Claim 28, these claims are also patentably distinguishable over Flora for at least these reasons. Accordingly, Applicants respectfully request that the rejections of Claims 28, 29 and 32 be withdrawn.

3. Claims 5, 8-10, 22, 23 and 30:

a. Claims 5 and 23:

Claim 5 depends from independent Claim 1 and Claim 23 depends from independent Claim 12. The Examiner cites Tiernan to supply the magnetic shielding recitation of Claims 5 and 23. However, Tiernan does not supply the above stated deficiencies of Flora with respect to independent Claims 1 and 12. Accordingly, Applicants respectfully submit that Claims 5 and 23 are patentably distinguishable over the cited art, either alone or in combination, and respectfully request that the rejections of Claims 5 and 23 be withdrawn.

b. Claims 8-10 and 22:

Claims 8-10 depend from independent Claim 6, and Claim 22 depends from independent Claim 12. The Examiner cites Tiernan to supply the GMR sensor recitation of Claims 8 and 22. However, Tiernan does not supply the above stated deficiencies of

Flora with respect to independent Claims 6 and 12. Accordingly, Applicants respectfully submit that Claims 8-10 and 22 are patentably distinguishable over the cited art, either alone or in combination, and respectfully request that the rejections of Claims 8-10 and 22 be withdrawn.

c. Claim 30:

Claim 30 depends from independent Claim 28. The Examiner cites Tiernan to supply the calibration curve recitation of Claim 30. However, Tiernan does not supply the above stated deficiencies of Flora with respect to independent Claim 28. Nor does either reference disclose the informative parameter recitation of Claim 30, as discussed above with respect to Claim 24. Accordingly, Applicants respectfully submit that Claim 30 is patentably distinguishable over the cited art, either alone or in combination, and respectfully request that the rejection of Claim 30 be withdrawn.

4. Claims 15-19.

The Examiner indicated that Claims 15-19 would be allowable if rewritten in independent form. Claim 15 has been rewritten in independent form and Claims 16-19 depend from Claim 15. Accordingly, Applicants respectfully submit that Claims 15-19 are in condition for allowance.

CONCLUSION

In view of the foregoing, Applicants respectfully submit that the application is in condition for allowance. Favorable reconsideration and prompt allowance of the application are respectfully requested.

Should the Examiner believe that anything further is needed to place the application in even better condition for allowance, the Examiner is requested to contact Applicants' undersigned representative at the telephone number below.

Respectfully submitted,

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